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# Accepted Manuscript

Long term economic impact associated with childhood bullying victimisation

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# Long term economic impact associated with childhood bullying victimisation

## Abstract

Being bullied is associated with mental health problems in childhood, with increasing evidence of persisting negative impacts, and increased mental health service use, into adulthood. There are also impacts of bullying victimisation on employment, income and being in poverty, but little is known about the long-term economic impacts. We therefore aimed to estimate the most important economic consequences at age 50 of being bullied in childhood: to our knowledge this is the first study that does so. Using 1958 British birth cohort data collected in 1965, 1969, 1991, 2003 and 2008 (study samples size 7,323-9,242), we find substantial and durable individual and societal economic impacts four decades after the childhood bullying occurred. Both men and women who were bullied in childhood were less likely to be in employment and had accumulated less wealth in the form of home-ownership or savings than participants who were not bullied. Individual earnings from paid employment were lower for women who were bullied in childhood. Frequent bullying in childhood was also associated with higher societal employment-related costs for men and higher health service costs for women. Our findings underline the importance of preventing bullying in childhood and, as the consequences are so long-lasting and pervasive, supporting people still experiencing the negative consequences in the decades that follow.

## Keywords

UK; childhood bullying; long-term; economic impact; mental health; health service use; employment; wealth

## Introduction

A substantial body of evidence in the UK and internationally shows that bullying victimisation is associated with mental health problems in childhood (e.g. Arseneault *et al.*, 2018). There is also increasing evidence of persisting negative impacts into the adult years (e.g. Wolke and Lereya, 2015; Arseneault, 2017). Relatedly, it is not surprising that childhood bullying victimisation is associated with increased mental health service use in childhood, adolescence, and early and mid-adulthood up to age 50 (Evans-Lacko *et al.*, 2016; Sourander *et al.*, 2009; Sourander *et al.*, 2016).

There are also socio-economic consequences of bullying victimisation. In a United States (US) cohort, childhood bullying victimisation was associated with more difficulties keeping a job when aged 24 to 26 (Wolke *et al.*, 2013). We similarly found that men who were bullied in childhood were more likely to be unemployed at age 50 than their peers (Takizawa *et al.*, 2014), using British birth cohort data (the National Child Development Survey; NCDS). In other analyses of the NCDS, bullied children had lower incomes than their peers at ages 23 and 33, although not at age 42 (Brown and Taylor, 2008). This study suggested that being bullied at school lowered wages earned during adulthood directly, as well as indirectly through educational attainment. Finally, in the US cohort, bullied children were more likely to be living in poverty when aged 24 to 26 than their non-bullied peers (Wolke *et al.*, 2013).

As these findings suggest, being bullied in childhood has adverse long-term consequences, but little is known about the long-term *economic* impacts, whether individual or societal. We aimed to estimate the most important economic consequences at age 50 of being bullied at ages seven and eleven, looking at a range of individual impacts (employment status, earnings and wealth) and societal impacts (costs of health service use for mental health problems and employment-related costs to society). These outcomes are linked not only to individual financial wellbeing and potential

costs to the state but may have other implications since wealth, both savings and home-ownership, is of key importance to individuals and society in a range of respects, including mental and physical health, social care and pensions (Crossley and O'Dea, 2010; ; Dunatchik, 2016; Marmot *et al.*, 2010; Pierse *et al.*, 2016; Pollack *et al.*, 2007).

## Data and Methods

### *Sample*

Participants are from the NCDS, the 1958 British birth cohort (Power and Elliott, 2006). Information was collected on 98% of all births in one week in 1958 in England, Scotland and Wales. During follow-up rounds of data collection at ages seven, eleven and sixteen years, the sample was augmented by 920 immigrants to the UK born in the study week, resulting in a total of 18,558 cohort members. Our sample for analysis comprises all cohort members for whom we have complete data on bullying in childhood and a range of outcomes at age 50: mental health service use (n=9,242); employment (n=8,581); earnings (n=7,323); housing tenure (n=9,222) and savings (n=7,559). Data used in our analysis were collected in 1965, 1969, 1991, 2003 and 2008.

Ethical approval was obtained by NCDS via NHS Research Ethics Committees (RECs) or, prior to their set-up in 1997, through internal review. Ethical approval for the biomedical survey was given by the South East Multi-Centre REC.

### *Measures*

#### *Assessment of bullying*

Exposure to bullying was assessed via parental interviews when participants were aged seven and eleven years. At each age, parents were asked if their child was bullied by other children 'never',

'occasionally' or 'frequently'. We combined responses from both interviews to create a three-level indicator of exposure to childhood bullying: 0 = never bullied (never at both seven and eleven years); 1 = occasionally bullied (occasionally at either seven or eleven years); 2 = frequently bullied (frequently at either seven or eleven years, or occasionally at both ages). Where only one parental interview was available, responses from that interview were used, providing bullying assessments for 86% of cohort members.

### ***Individual economic impacts at age 50***

We looked at three possible *individual* economic impacts of childhood bullying: economic status, weekly earnings and wealth. Earnings penalties of bullying victimisation were based on comparisons of self-reported weekly net individual earnings from paid employment at age 50. In NCDS, this question was only asked of participants in paid employment and so did not include people in self-employment, unemployed or economically inactive. Measures of wealth at age 50 were housing tenure and savings. Housing tenure was categorised as either owner-occupation or renting, the latter comprising both private and social renting. For savings, we created a categorical variable of 'no-to-low' savings, defined as savings between zero and £392.92, 'low-to-median' savings and above median savings. The upper level for no-to-low savings (£392.92) was based on the PSE2012 (Poverty and Social Exclusion in the UK) Individual Deprivation Measure (Gordon, 2017) deflated to 2008 values (i.e. the year when NCDS cohort members were age 50), using the Retail Price Index.

### ***Societal economic impacts at age 50***

We considered two measures of *societal* economic impact: costs associated with health service use for mental health problems and employment-related costs to society. In estimating these, we used 2008 cost levels throughout, to match with the date of the age 50 data collection.

### **Health service use for mental health conditions**

As the majority of mental health care occurs outside of specialty 'mental health' care settings (Brown *et al.*, 2014; Evans-Lacko, 2017), and there is a widespread reluctance among individuals to report seeking help for mental health problems (Clement *et al.*, 2015), we included service use for mental health conditions occurring in both specialty mental health *and* general health settings. We looked at three types of health service use reported by participants at age 50: specialty mental health service use over the previous four years, general hospital outpatient service use and general hospital inpatient service use over the previous eight years. To estimate costs associated with hospital inpatient service use, we multiplied the number of hospital inpatient days reported by the participant over the previous eight years by the World Health Organization mean cost estimate for the UK per hospital inpatient bed-day in 2008 (WHO, 2011). For frequency of outpatient service use in the previous eight years, possible responses included: none, one or two, three to five, six to ten and more than ten. The median number of visits for each respondent was multiplied by the mean unit cost per outpatient visit in 2008 (Curtis, 2008). As frequency of specialty mental health service use at age 50 is unavailable in NCDS, we estimated annual service use frequency and associated costs according to national averages stratified by gender from the 2000 Adult Psychiatric Morbidity Survey for the sub-sample aged 42 to 50. To enable aggregation of costs across all three types of health service use, annual specialty mental health costs were multiplied by eight to give estimated eight-year costs.

### **Employment-related societal costs at age 50**

We estimated employment-related costs to society using the human capital approach, which has been widely used in other economic evaluations (e.g. Park *et al.*, 2014). Costs were calculated for individuals in employment, self-employment, unemployment or economically inactive through temporary or permanent sickness or disability. We considered full-time employment to be 35 or more hours per week and applied the national minimum hourly wage in 2008 (£5.73 an hour) to



hours worked per week less than the 35-hour full-time equivalent. This was then multiplied by 48 on the assumption of 48 working weeks in one year. Finally, we estimated aggregate annual societal costs of being bullied in childhood by multiplying per-person societal costs by the estimated numbers aged 50 in 2008 who had been bullied in childhood. This was estimated using prevalence of being frequently bullied in childhood from our NCDS sample and mid-year estimates of the UK population aged 50 in 2008 (ONS, 2012).

## **Covariates**

### **Childhood confounders**

We controlled for childhood confounders known to be associated with bullying, and with the outcomes under study (Takizawa *et al.*, 2014; Evans-Lacko *et al.*, 2016). Childhood IQ was assessed at age eleven using a standardized 80-item general ability test (Douglas, 1964). Scales of childhood emotional and behavioural problems were derived from teacher ratings on the Bristol Social Adjustment Guides (Stott, 1969) at ages seven and eleven years. We used the mean of scores across ages seven and eleven years where both measures were available, and single-age measures for the remainder of the sample. Family social class in childhood was classified on the basis of the father's occupation when the sample member was aged seven years, and categorised as 'I and II' professional/managerial/technical, 'IIINM' other non-manual, 'IIIM' skilled manual, and 'IV and V' unskilled manual (OPCS, 1980). Childhood adversity was assessed from both prospective and retrospective reports. Prospectively, information collected from parents and teachers was used to create an eight-item scale of low parental involvement and activity with the child at ages seven and eleven (Power and Elliott, 2006). Retrospectively at age 45, participants completed a 16-item questionnaire about their exposure to a range of childhood adversities including poverty, parental mental ill-health and drug/alcohol problems, family conflict, and physical and sexual abuse (Rosenman, 2004), but not childhood bullying.

**Adult covariates**

In follow-on analyses, we also controlled for covariates in adulthood (age 33) known to be associated with both being bullied in childhood (Brown and Taylor, 2008; Takizawa *et al.*, 2014) and with the economic impacts. These covariates were partnership status, highest educational qualification and psychological distress as measured by the Malaise Inventory, a nine-item questionnaire with validity in population samples (Rodgers, 1999). Data on these covariates were collected after the bullying victimisation took place and before the economic impacts at age 50, so could indicate ways in which childhood bullying victimisation might affect economic outcomes at age 50.

**Analysis**

We report descriptive statistics to characterise the sample by bullying victimisation and by gender, with Chi-squared tests and tests of means used to determine any group differences. In comparing economic outcomes by bullying victimisation, we considered two sets of regression models. Firstly, bivariate analyses compared economic outcomes between participants who were occasionally or frequently bullied in childhood with those who were not. The second set of regression models additionally controlled for childhood confounders. For linear outcome variables – earnings, health service costs and employment-related costs - we utilised two-part generalised linear models (GLM) (Mullahy, 1998). As the dependent variables may have skewed distributions, we used a modified Park test (Manning and Mullahy, 2001), to select the most appropriate distribution for the purposes of estimation. The marginal effect of bullying status on each outcome was estimated for each regression model, generating estimates of mean cost differences for people who were occasionally bullied and frequently bullied compared to people who were never bullied. For categorical outcome variables - economic status, housing tenure and savings category - we used logistic regression

models. As health service use, employment rates, earnings and wealth tend to differ by gender (Evans-Lacko *et al.*, 2016; ONS, 2013; ONS, 2016), we estimated economic impacts separately for women and men.

Finally, we explored potential mediators of these economic impacts, by additionally controlling for adult (age 33) covariates - partnership status, highest educational qualification and psychological distress - in our regression models. Covariates that reduce the size of the effect can be considered as potentially plausible explanations for the observed associations.

All tests of statistical significance used robust standard errors. A significance level of 0.05 was used as the criterion to determine statistical significance and 0.10 to indicate marginal significance. We conducted the analyses using Stata 14.2 (StataCorp, 2015).

### **Attrition**

To investigate whether attrition was associated with the variables in our analysis, we explored the savings variable as this had the highest proportion of missing data. Descriptive data showed that data non-availability because of attrition and/or missingness was unrelated to childhood bullying but was associated with the childhood confounders, except adversity (supplementary table available from authors on request). To account for potential attrition bias, the analyses incorporated inverse probability weights to address this differential sample attrition. These were derived from logistic regression analyses predicting availability of complete data on childhood bullying and each outcome at age 50, including all the childhood confounder variables except adversity.

## Results

### *Childhood and early adult correlates of bullying victimisation*

Rates of childhood bullying victimisation were higher among men than women (table 1). Being occasionally or frequently bullied in childhood was associated with a range of potential childhood confounders. Both women and men who were bullied in childhood had lower general ability test scores, and elevated levels of internalising and externalising problems in childhood compared to those who were never bullied. They were more likely to come from skilled or unskilled manual social class backgrounds than those who were never bullied. They were at higher risk of experiencing other forms of childhood adversity. Table 1 also shows that being occasionally or frequently bullied in childhood was associated with having lower educational qualifications and higher psychological distress at age 33 for both men and women and less likelihood of having a partner at age 33 for men.

<TABLE 1 ABOUT HERE>

### *Economic impacts at age 50: women*

Our bivariate analysis showed that, for women, being occasionally or frequently bullied in childhood was significantly associated with worse economic outcomes at age 50 in every domain (table 2). The addition of childhood confounders reduced the odds ratios (OR), relative risk ratios (RRR), or costs of poorer economic outcomes associated with bullying alone, in some cases substantially. However, even after accounting for these childhood factors there were still significant economic consequences at age 50 of being frequently bullied in childhood. The main exception was societal employment costs where differences in costs by bullying for women were accounted for by differences in the childhood confounders.

<TABLE 2 ABOUT HERE>

Controlling for childhood confounders, women who were occasionally or frequently bullied in childhood had marginally higher odds of 1.34 (95% CI=0.97, 1.84) and 1.39 (95% CI=0.94, 2.06) respectively of being unemployed or economically inactive due to sickness or disability compared to women who were never bullied. Women who were frequently bullied in childhood had lower net weekly earnings from paid employment (on average £22.74 a week lower at 2008 values) and less likelihood of owning a property at age 50 (OR=0.76; 95% CI=0.57, 1.01) than women who were not bullied, even controlling for childhood confounders. Additionally, women who were frequently bullied in childhood had higher odds of having accumulated only no-to-low (RRR=1.68; 95% CI=1.23, 2.29) or low-to-median (RRR=1.80; 95% CI=1.37, 2.38) savings by mid-life compared to those who were never bullied.

Focusing on societal impact, being frequently bullied in childhood was associated with £717 higher health service costs for mental health conditions over an eight-year period at mid-life among women, even controlling for childhood confounders. Aggregated to the estimated affected population, this was an estimated £4.5 million annually.

#### ***Economic impacts at age 50: men***

Bivariate analysis showed that for men, being frequently bullied in childhood was associated with worse economic outcome at age 50 in every domain and occasionally bullied with worse outcomes in most domains (table 3). Similarly to women, the addition of childhood confounders reduced the odds or costs of the economic outcomes associated with being bullied, although significant economic impacts were still observed in many areas. The exceptions were weekly income and health service costs where childhood confounders explained the differences seen.

Controlling for childhood confounders, men who were frequently bullied in childhood were at increased risk (OR=1.49; 95% CI =1.04, 2.13) of being unemployed or economically inactive due to

sickness or disability compared to men who were never bullied. We did not observe differences in weekly net earnings at mid-life for men who experienced bullying in childhood. Men who were frequently bullied in childhood had lower odds of owning a property at age 50 compared to their non-bullied peers (OR=0.74; 95% CI=0.56, 0.97), and marginally higher risk of having no-to-low savings (RRR=1.31; 95% CI=0.97, 1.78).

<TABLE 3 ABOUT HERE>

Moving on to societal impacts, we found employment-related societal economic impacts were higher for men who were frequently bullied in childhood compared to those who were never bullied, with extra costs to society of £271 annually, even controlling for childhood confounders. Applied to the estimated affected population in 2008, this represents an aggregate cost to society of an estimated £17.9 million a year.

#### ***Adult mediators of economic impacts***

We then turned to possible mediators of the economic impacts of being bullied in childhood: partnership status, highest educational qualification and psychological distress, all at age 33 (Table 4).

< TABLE 4 ABOUT HERE >

Adding these adult covariates to the model reduced the earnings difference for women frequently bullied in childhood compared to never bullied by about a quarter and reduced the odds ratio of being unemployed or economically inactive for women who were occasionally bullied compared to never bullied. The adult covariates did not appear to have much effect on any of the other *individual*

outcomes for women, although they did reduce estimates of the *societal* costs of health service use for mental health conditions by just under a third. For men, the addition of adult covariates appeared to make little difference to odds of being unemployed/economically inactive due to long-term sickness or disability, odds of owner-occupation nor odds of having no-to-low savings when aged 50, although societal employment-related costs were reduced by a third. These results suggest that partnership status, highest educational qualification and psychological distress at age 33 are potential explanations for *some* of the economic impacts at age 50 of being bullied in childhood. However, in most cases, economic impacts were still observed even after additionally controlling for these factors.

## Discussion

To our knowledge, this is the first study that looks at the long-term economic consequences of childhood bullying victimisation. We find substantial and durable individual and societal economic impacts at mid-life of being bullied in childhood. Four decades after the bullying occurred, both men and women who were bullied in childhood were less likely to be in employment and had accumulated less wealth in the form of home-ownership or savings than participants who were not bullied. Additionally, women who were bullied in childhood had lower earnings from paid employment. We also identified societal economic impacts associated with childhood bullying: frequent bullying in childhood was associated with higher employment-related costs at age 50 for men and higher health service costs at age 50 for women. The latter is consistent with the higher mental health service use seen by adults who were bullied as children in other research (Evans-Lacko *et al.*, 2016; Sourander *et al.*, 2016).

The reasons for lower earnings and higher unemployment among those who were bullied during childhood are likely to be similar. Both are associated with lower educational attainment, and bullied children have lower educational attainment than their non-bullied peers (Brown and Taylor, 2008)).

Bullied children miss more school than non-bullied children (Brown *et al.*, 2011), which may be because being bullied at school results in reluctance to attend and/or because of the contemporaneous mental and physical ill-health associated with bullying. Bullied children may find it harder to concentrate when they are in school, again either directly because of the bullying or because of the associated health problems, psychological difficulties in particular. Furthermore, bullying victimisation may lead to cognitive problems which can affect educational attainment (Takizawa *et al.*, 2014). Low self-esteem associated with bullying victimisation (Smokowski and Holland, 2005) is another potential mechanism by which educational attainment may be affected (Waddell, 2006).

Many of the adulthood consequences of childhood bullying victimisation may also directly impact on employment and earnings. The lower self-esteem and confidence of adults who were bullied as children (Waddell, 2006) plausibly impacts on job-seeking or promotion-seeking, working hours, or performance at work. Another potential pathway is that being bullied may alter physiological responses to stress (Ouellet-Morin *et al.*, 2011) which may lead to withdrawal from the labour market or reduction in working hours. Poorer mental health is associated with higher unemployment and lower income, as are physical health problems. For example, the poorer mental and physical health reported by adults who have been bullied as children often stands in the way of work (Allison *et al.*, 2009) and in our analysis the costs associated with non-employment include those who are permanently or temporarily unable to work because of sickness. Relationship status is associated with employment and people who are bullied in childhood are less likely to be in a relationship than their non-bullied peers (Takizawa *et al.*, 2014). In our analysis exploring the role of educational attainment, mental health and relationship status further, we found that these factors at age 33 appear to be potential explanations in the earnings differences for frequently bullied women and the employment costs for frequently bullied men.



We found wealth penalties of being bullied in two domains: housing and savings. Wealth can be considered a measure of accumulation of assets over the life-course. Our findings thus show not only the economic consequences of bullying four decades after being bullied in childhood, but also point to accumulative, life-course, economic consequences. There are significant implications of having low wealth in mid-life. Wealth can provide protection against both present and future financial shocks associated with, for example, unemployment, serious illness or relationship breakdown, and hence provide a measure of financial resilience. The cut-off point for low savings we use is drawn from a robust scale of deprivation items (Gordon, 2017). Savings above this level can provide some financial protection against unexpected, but necessary, expenses. Without this, there is higher risk of debt, which could become unmanageable, or going without necessities.

Savings wealth is linked to other types of wealth which provide financial protection: for example, those with higher savings are more likely to own their home and to contribute to pension schemes (Crossley and O'Dea, 2010). As well as having individual economic impacts, savings wealth has other implications, both individual and societal. One currently quite high-profile example is paying for social care. For example, at present in England, savings wealth determines financial eligibility for state funding for social care. Furthermore, research in England has shown a relationship between level of savings and unmet need for services (Dunatchik, 2016). Wealth, especially housing wealth, is an important factor for better physical and mental health (Pierse *et al.*, 2016; Pollack *et al.*, 2007) and can be considered one of the most important contributors to socio-economic health inequalities (Marmot *et al.*, 2010; Pollack *et al.*, 2007;).

Accumulation of wealth results from being consistently in adequately paid employment over the longer term, and thus some of the potential ways in which bullying may impact on earnings and/or employment are also relevant to wealth. Another factor may be inheritance, which plays a role in both home-ownership and wealth. However, our analyses controlled for family socio-economic class,

one measure of family wealth and hence inheritance, and the association of home-ownership with bullying still remains. People who have been bullied in childhood are less likely to be in relationships as adults (Takizawa *et al.*, 2014), and partnership status is strongly associated with home-ownership (Thomas and Mulder, 2016). However, once again, the negative association between home-ownership and being bullied remains even when controlling for partnership status age 33.

The possible ways in which bullying in childhood may impact on mental ill-health in adulthood even four decades after its occurrence have been reviewed elsewhere (Evans-Lacko *et al.*, 2016; Sourander *et al.*, 2016; Takizawa *et al.*, 2014; Wolke and Lereya, 2015) and include long-term trauma of early adverse experiences increasing vulnerabilities to later mental health problems (Shonkoff *et al.* 2009), interpersonal processes (Kendler *et al.*, 2003), and physiological responses (Ouellet-Morin *et al.*, 2011). There may be other common factors for being exposed to bullying and mental health problems which we did not control for.

Mental health problems associated with bullying might translate into higher health service use among bullied children and there is certainly some evidence for this (Evans-Lacko *et al.*, 2016; Sourander *et al.*, 2016). However, the relationship between health service use for mental health problems and the existence of those problems is by no means straightforward. Under- or mis-diagnosis, stigma, sub-threshold mental health problems and lack of available and/or suitable services are some of the reasons why the presence of a mental health problem does not necessarily result in accessing services for that problem; it is telling that differences in health service costs, although significantly reduced, remain for women even after controlling for one measure of psychological distress in adulthood. Nonetheless our previous research found a significant relationship between bullying victimisation in childhood and mental health service use in adulthood, although at age 50 this was only the case for women (Evans-Lacko *et al.*, 2016). Here we have extended that analysis, factoring in intensity of service use by considering both frequency and type

of health service use, and then estimating different costs by gender. Using this method, we found that health service costs for women who were frequently bullied were more than £700 higher than for their non-bullied peers, with no significant differences in costs for men. Reasons for this gender difference may be to do with the greater help-seeking among women with mental health problems seen in other research (Evans-Lacko *et al.*, 2014).

There were other gender differences observed in our study. Women who were bullied in childhood had lower earnings than their non-bullied peers, whereas bullied men did not. This is likely to be due to differences in hours worked per week, which is a more important determinant of earnings for women than for men (Blundell *et al.*, 2013). Both men and women had higher odds of having no-to-low savings if they had been frequently bullied in childhood. However, women who were frequently bullied in childhood also had higher odds of having low-to-median savings whereas there were no differences for men. Both men and women were less likely to be in employment if they had been bullied in childhood, but it was men for whom there were associated societal costs. Overall, we found that childhood bullying appeared to have a differential, and worse, economic impact in later life for women than for men. This may be because women and men are differently affected by childhood bullying in the first place, and/or because the negative impacts of being bullied manifest differently for women and men because of gender differences in the wider socio-economic environment. Although there are no other studies on the long-term economic consequences of being bullied in childhood, research on childhood maltreatment concluded that women were more vulnerable than men to the long-term economic impacts of childhood abuse or neglect (Currie and Widom, 2010).

There are a number of limitations to our study. Attrition by age 50 and missing data reduces the number of cases for some of our outcomes. However, we controlled for effects of selective attrition by utilising inverse probability weights in the analyses. Information on exposure to bullying was

assessed via parental interviews in NCDS so may underestimate incidence, as not all childhood bullying is known about by parents. Shakoor and colleagues (2011) found 'modest' (52-56%) agreement between mother and child reports of bullying at this age but similar associations between child emotional and behavioural problems and bullying victimisation, regardless of informant. Whilst data from more than one informant is the preferred option, in the absence of child self-reports, mothers' reports can be considered a viable alternative.

Another potential limitation of our study is that there may be recall bias, in particular for service use, although self-report is considered an acceptable method for collecting service use data (Patel *et al.*, 2005). Self-reports of earnings can also be subject to recall or estimation bias, although the NCDS question asked about very recent, and short, timeframes. Reported earnings can also be sensitive to social desirability bias, but the self-completion or computer-assisted methods used in NCDS reduces this risk considerably. Earnings are limited to earnings from paid employment, an approach that has been used in other similar research using NCDS. Use of average frequencies of service use interpolated over the time frame and average national costs for estimation of health service costs may have resulted in under- or over- estimates of actual costs. Using the minimum wage to estimate societal employment-related costs is also likely to be an underestimate. Furthermore, although we have looked at both individual and societal impacts, and in a number of domains, there may be other economic consequences of bullying which we have not estimated here.

The strengths of our analyses are that they are based on a large nationally representative cohort dataset with rich data on childhood bullying victimisation and on a range of outcomes collected through to age 50 to which we can apply individual and societal costs. We have also been able to control for key confounders, showing that our analyses are robust. Using these data, our study is the first to estimate individual and societal costs in mid-life in a number of spheres of bullying in childhood.

## Conclusions

Bullying in childhood is widespread, with consistent evidence of negative impacts across diverse samples in terms of age of being bullied, time, geographic location and culture. Internationally, one in three children report having been bullied at some point in their lives, with 10% to 14% experiencing chronic bullying lasting for more than six months (World Health Organization, 2012). Bullying was reported by 34% to 46% of school children in England in recent surveys (Department of Health, 2015), similar to the prevalence in our NCDS sample. Vulnerable children are at higher risk of being bullied (Arseneault *et al.*, 2018; Chatzitheochari *et al.*, 2014; Gower *et al.*, 2015; McMahon, 2010; Woods *et al.*, 2009). That it has personal and economic consequences for both individuals and society four decades later should raise significant concerns.

By showing the economic consequences for individuals and society of being bullied in childhood, our study further underlines the importance of investing in the implementation of effective policies and practices to prevent or reduce bullying in schools and thus mitigate negative outcomes and costs. Of course, tackling bullying is particularly a concern because of the quality of life effects on those who are bullied. There is evidence of effective anti-bullying initiatives (see for example the meta-analysis by Ttofi and Farrington, 2011) and indeed cost-effective initiatives, many of which are low cost (from £8-16 per person per year) (Beecham *et al.*, 2011; McDaid *et al.*, 2017). This compares to our estimated annual societal costs per person of being bullied of £90 for women and £271 for men at age 50 in 2008. As risk of being bullied is higher among already disadvantaged children and the poorer economic outcomes seen here compound that disadvantage in later life, anti-bullying initiatives also have a potentially important role to play in supporting vulnerable, disadvantaged children and reducing inequities in later life.

As the consequences of childhood bullying are long-lasting and pervasive, it is imperative that response in this area should be multi-faceted. It needs to prevent bullying, to provide support for children (and adults) who are currently being bullied, and to provide support for people who were bullied previously (whether in childhood or subsequently) and who are still experiencing the negative consequences of it in the years that follow. Better integration of mental health and anti-bullying provision could prevent young victims developing long-term mental health problems, and the costs associated with this. Given the potential mediating role in adulthood of psychological distress, and educational qualifications and relationship status, supporting adults bullied as children might usefully include relationship and other social support, access to adult education and support with mental health problems.

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Table 1. Descriptive statistics of sample childhood socio-demographic characteristics by bullying and gender

	Female (n=4,702)			Male (n=4,540)		
Bullied in childhood	Never % (N) 61.6 (2,895)	Occasionally % (N) 26.2 (1,231)	Frequently % (N) 12.3 (576)	Never % (N) 55.7* <sup>1</sup> (2,527)	Occasionally % (N) 28.5* <sup>1</sup> (1,296)	Frequently % (N) 15.8* <sup>1</sup> (717)
<b>CHILDHOOD CONFOUNDERS</b>						
General ability test score (mean; SD)	48.0 (14.9)	44.7* (15.3)	42.2* (15.2)	45.5 (15.3)	43.3* (16.0)	41.8* (16.2)
Internalising score (mean; SD)	1.75 (0.85)	1.90* (0.88)	2.01* (0.97)	1.89 (0.86)	2.06* (0.94)	2.22* (0.98)
Externalising score (mean; SD)	1.76 (0.84)	1.84* (0.90)	1.94* (0.93)	1.97 (0.97)	2.08* (1.03)	2.22* (1.08)
Parental social class % (N)						
Skilled professional/ managerial/technical	23.6 (676)	18.7* (230)	16.2* (93)	25.3 (634)	19.4* (250)	15.6* (112)
Skilled non-manual	10.5 (302)	10.0* (123)	7.64* (44)	9.9 (248)	11.4* (147)	8.7* (62)
Skilled manual	42.7 (1,224)	43.7* (536)	44.3* (255)	40.7 (1,020)	42.1* (543)	50.5* (362)
Unskilled manual	23.3 (668)	27.6* (339)	31.9* (184)	24.1 (604)	27.1* (349)	25.2* (181)
Childhood adversity score (mean; SD)	1.51 (2.29)	1.74* (2.38)	1.90* (2.38)	1.19 (1.80)	1.41* (2.09)	1.52* (2.08)
Low parental involvement score (mean; SD)	0.90 (1.25)	1.11* (1.40)	1.15* (1.40)	0.93 (1.30)	1.11* (1.40)	1.42* (1.67)
<b>ADULT COVARIATES (AGE 33)</b>						
Partner % (N)	83.5 (2,098)	80.2 (865)	83.6 (418)	83.1 (1,754)	80.5* (860)	75.1* (432)
Highest educational qualification % (N)						
None	9.2 (232)	12.5* (134)	17.6* (88)	7.4 (156)	8.7* (93)	13.9* (80)
CSE, O Level or equivalent	49.6 (1,256)	52.9* (569)	54.5* (273)	39.4 (835)	42.8* (458)	41.2* (237)
A Level or equivalent	27.3 (691)	23.6* (254)	20.6* (103)	36.0 (763)	33.2* (355)	33.9* (195)
Degree or higher	13.9 (351)	11.1* (119)	7.4* (37)	17.3 (368)	15.4* (165)	11.1* (64)
Psychological distress (mean; SD)	1.07 (1.53)	1.36* (1.73)	1.51* (1.86)	0.58 (1.15)	0.74* (1.29)	0.90* (1.46)

\*p &lt; .05; reference group is never bullied except (1) where reference group is women

Table 2. Association between being bullied in childhood and individual and societal economic impact for women at age 50

INDIVIDUAL ECONOMIC IMPACTS	Bullied at age 7 & 11		Economic impact: bivariate results	Economic impact controlling for childhood confounders <sup>1</sup>
Economic status		%	Odds ratio (95% CI)	
Unemployed or economically inactive	Never (n=2,544)	6.8	-	-
	Occasionally (n=1,099)	8.7	<b>1.44*</b> (1.09, 1.91)	<b>1.34~</b> (0.97, 1.84)
	Frequently (n=504)	11.9	<b>1.85*</b> (1.32, 2.58)	<b>1.39~</b> (0.94, 2.06)
Earnings		Mean	Earnings difference (95% CI)	
Mean weekly earnings (£) from paid employment	Never (n=2,015)	301.25	-	-
	Occasionally (n=883)	281.27	<b>-21.05*</b> (-37.76, -4.34)	-8.72 (-25.92, 8.48)
	Frequently (n=386)	258.50	<b>-41.92*</b> (-60.89, -22.96)	<b>-22.74*</b> (-42.05, -3.43)
Housing tenure		%	Odds ratio (95% CI)	
Not owner occupier	Never (n=2,889)	14.3	-	-
	Occasionally (n=1,230)	18.3	<b>0.76*</b> (0.63, 0.93)	0.87 (0.69, 1.10)
	Frequently (n=573)	20.6	<b>0.65*</b> (0.51, 0.83)	<b>0.76~</b> (0.57, 1.01)
Savings		%	Relative risk ratio (95% CI)	
No-to-low savings compared to above median savings	Never (n=2,281)	20.2	-	-
	Occasionally (n=975)	25.6	<b>1.51*</b> (1.23, 1.85)	<b>1.25~</b> (0.99, 1.58)
	Frequently (n=432)	30.1	<b>2.03*</b> (1.55, 2.67)	<b>1.68*</b> (1.23, 2.29)
Low-to-median savings compared to above median savings	Never (n=2,281)	29.6	-	-
	Occasionally (n=975)	30.2	<b>1.27*</b> (1.05, 1.53)	1.67 (0.95, 1.44)
	Frequently (n=432)	33.3	<b>1.71*</b> (1.33, 2.21)	<b>1.80*</b> (1.37, 2.38)
<b>SOCIETAL ECONOMIC IMPACTS</b>		Mean	Cost difference (95% CI)	
Eight-year health service costs for mental health problems (£)	Never (n=2,884)	2516.76	-	-
	Occasionally (n=1,222)	2814.83	<b>422.96~</b> (-16.28, 862.20)	371.06 (-63.65, 805.77)
	Frequently (n=570)	3470.11	<b>1,040.33*</b> (546.94, 1533.73)	<b>717.08*</b> (244.39, 1,189.76)
Mean annual societal employment cost (£)	Never (n=2,527)	2175.18	-	-
	Occasionally (n=1,093)	2284.62	<b>243.27~</b> (-1.58, 488.12)	68.73 (-173.01, 310.47)
	Frequently (n=499)	2549.22	<b>463.16*</b> (116.88, 809.44)	123.45 (205.33, 452.23)

\*p < .05; ~p < 0.10; Significant and marginal associations are highlighted in bold. 1. Controlling for family social class, adversity, low parental involvement, childhood IQ, childhood emotional and behavioural problems

Table 3. Association between being bullied in childhood and individual and societal economic impact for men at mid-life

INDIVIDUAL ECONOMIC IMPACTS	Bullied at age 7 & 11		Economic impact: bivariate results	Economic impact controlling for childhood confounders <sup>1</sup>
Economic status		%	Odds ratio (95% CI)	
Unemployed or economically inactive	Never (n=2,472)	7.7	-	-
	Occasionally (n=1,264)	9.2	1.21 (0.92, 1.58)	0.90 (0.64, 1.27)
	Frequently (n=698)	14.0	<b>2.06*</b> (1.56, 2.72)	<b>1.49*</b> (1.04, 2.13)
Earnings		Mean	Earnings difference (95% CI)	
Mean weekly earnings (£) from paid employment	Never (n=1,622)	539.72	-	-
	Occasionally (n=849)	524.38	-23.49(-68.27, 21.28)	-7.72 (-49.10, 34.66)
	Frequently (n=448)	464.21	<b>-70.34*</b> (-105.90, -34.80)	-8.55 (-46.98, 29.88)
Housing tenure		%	Odds ratio (95% CI)	
Not owner occupier	Never (n=2,528)	15.0	-	-
	Occasionally (n=1,292)	17.0	<b>0.82*</b> (0.67, 1.00)	0.99 (0.78, 1.26)
	Frequently (n=710)	22.5	<b>0.57*</b> (0.46, 0.72)	<b>0.74*</b> (0.56, 0.97)
Savings		%	Relative risk ratio (95% CI)	
No-to-low savings compared to above median savings	Never (n=2,130)	16.8	-	-
	Occasionally (n=1,120)	20.3	<b>1.35*</b> (1.09, 1.67)	1.12 (0.87, 1.45)
	Frequently (n=621)	26.3	<b>1.90*</b> (1.49, 2.43)	<b>1.31~</b> (0.97, 1.78)
Low-to-median savings compared to above median savings	Never (n=2,130)	36.0	-	-
	Occasionally (n=1,120)	35.7	1.12 (0.94, 1.33)	1.00 (0.82, 1.21)
	Frequently (n=621)	35.1	<b>1.22~</b> (0.98, 1.51)	1.11 (0.87, 1.40)
<b>SOCIETAL ECONOMIC IMPACTS</b>		Mean	Cost difference (95% CI)	
Eight-year health service costs for mental health problems (£)	Never (n=2,515)	2270.53	-	-
	Occasionally (n=1,288)	2777.60	<b>554.80*</b> (65.77, 1,043.84)	-97.2 (-510.31, 315.92)
	Frequently (n=714)	3199.91	<b>1,141.25*</b> (348.19, 1,934.31)	481.03 (-116.11, 1078.17)
Mean annual societal employment cost (£)	Never (n=2,459)	921.98	-	-
	Occasionally (n=1,253)	1117.06	<b>189.19~</b> (-35.31, 407.69)	14.64 (-183.38, 212.66)
	Frequently (n=693)	1588.72	<b>728.31*</b> (417.70, 1038.93)	<b>270.70*</b> (5.66, 535.74)

\*p < .05; ~p < 0.10; Significant and marginal associations are highlighted in bold. 1. Controlling for family social class, adversity, low parental involvement, childhood IQ, childhood emotional and behavioural problems

Table 4: Association between being bullied in childhood and individual and societal economic impact for women and men at mid-life additionally controlling for adult covariates

INDIVIDUAL IMPACTS	Bullied at age 7 & 11	Women	Men
		Childhood confounders and Adult covariates	Childhood confounders and Adult covariates
Economic status		Odds ratio (95% CI)	
Unemployed or economically inactive	Occasionally	1.07 (0.73, 1.56)	-
	Frequently	1.22 (0.78, 1.91)	1.37 (0.92, 2.06)
Earnings		Cost difference (95% CI)	
Mean weekly earnings (£) from paid employment	Occasionally	-	-
	Frequently	<b>-16.58~</b> (-55.22, 2.12)	-
Housing tenure		Odds ratios (95% CI)	
Not owner occupier	Occasionally	-	-
	Frequently	0.84 (0.61, 1.56)	0.78 (0.57, 1.07)
Savings		Relative risk ratio (95% CI)	
No-to-low savings compared to above median savings	Occasionally	1.16 (0.90, 1.50)	-
	Frequently	<b>1.55*</b> (1.08, 2.22)	1.22 (0.87, 1.73)
Low-to-median savings compared to above median savings	Occasionally	-	-
	Frequently	<b>1.75*</b> (1.30, 2.36)	-
SOCIETAL ECONOMIC IMPACTS			
Eight-year health service costs for mental health problems (£)	Occasionally	-	-
	Frequently	<b>520.20*</b> (39.79, 1,000.61)	-
Mean annual societal employment cost (£)	Occasionally	-	-
	Frequently	-	£173.92 (-93.03,440.87)

\*=p< 0.05; ~=p <0.10; Significant and marginal associations are highlighted in bold.

Controlling for family social class, adversity, neglect, childhood IQ, childhood emotional and behavioural problems and partnership status, highest educational qualification and psychological distress age 33

**Long term economic impact associated with childhood bullying victimisation****Highlights**

- First study to explore long-term economic effects of being bullied in childhood
- Sizeable individual and societal economic impacts 4 decades after bullying occurred
- Adults bullied in childhood less likely to be in employment in mid-life
- Childhood bullying impacted on individual's mid-life income and accumulated wealth
- Higher societal employment costs for men and higher health service costs for women